

Neutrons in the Upstream Veto Wall

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Short report
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Outline

- Introduction
- Detection efficiency
- GEANT results
- Plots
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- Outlook



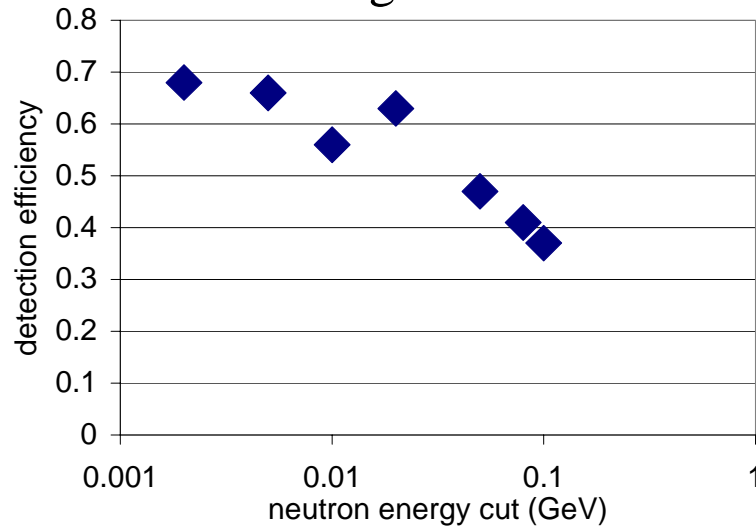
Introduction

- Neutrons in the upstream veto wall self-veto events
- Our veto counters and PMTs are from E-12 (1970)
- The efficiency for 0.1 GeV neutrons was $\approx 10\%$ per counter (*Vittorio, E-12 paper from 1972*)

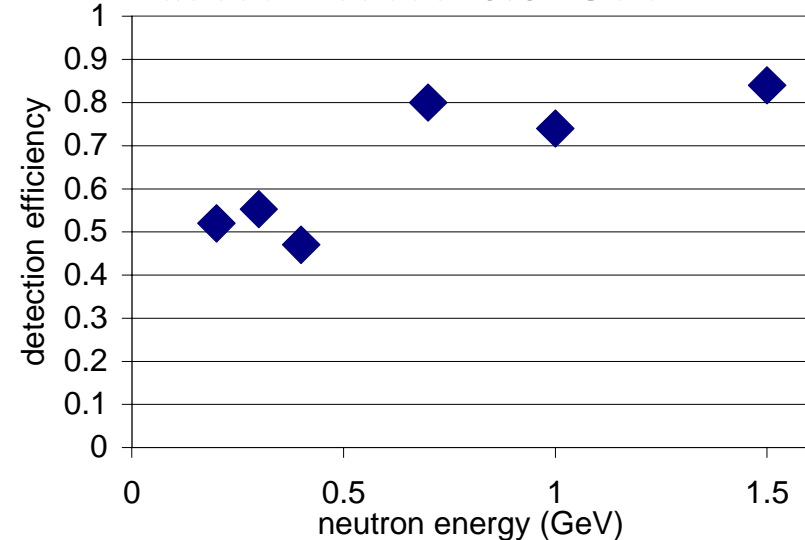


Neutron Detection Efficiency (GEANT)

0.5GeV single neutrons:



hadcut=neucut=0.01GeV



- The neutron detection efficiency decreases as the neutron energy cut increases (fixed hadron energy cut=0.01GeV)
- The GEANT detection efficiency is much higher than the measured efficiency ($\approx 20\%$)



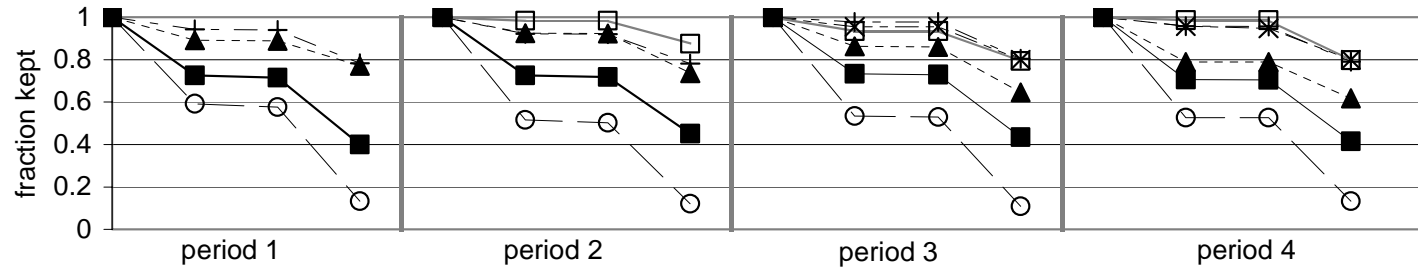
Result of GEANT Simulation

- Plots:
 - Trigger, stripping, and cat3 selection efficiency
 - Visual selection efficiency
 - Expected vs. observed # of muon events
 - Expected vs. observed # of cat3 events



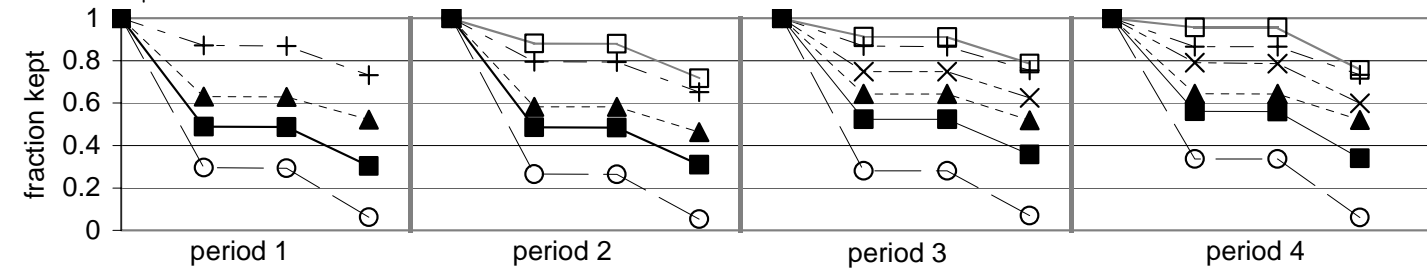
Efficiency per Module per Period

ν_e CC interaction

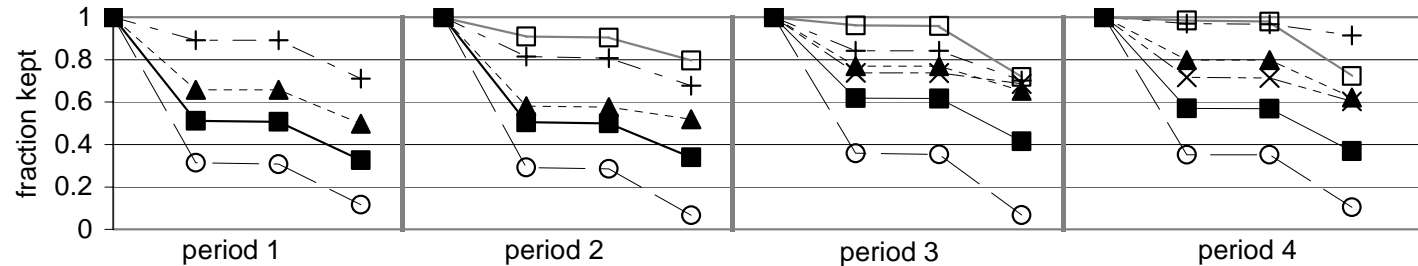


- all modules
- module 0
- ▲ module 1
- × module 2
- + module 3
- module 4

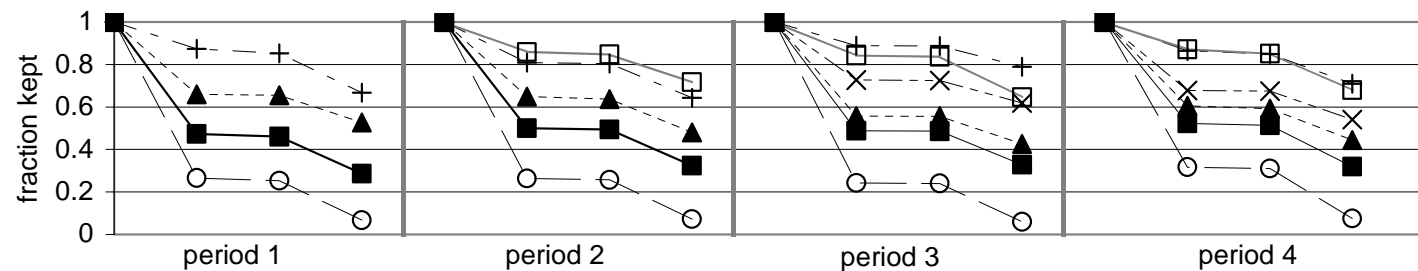
prompt ν_μ CC interaction



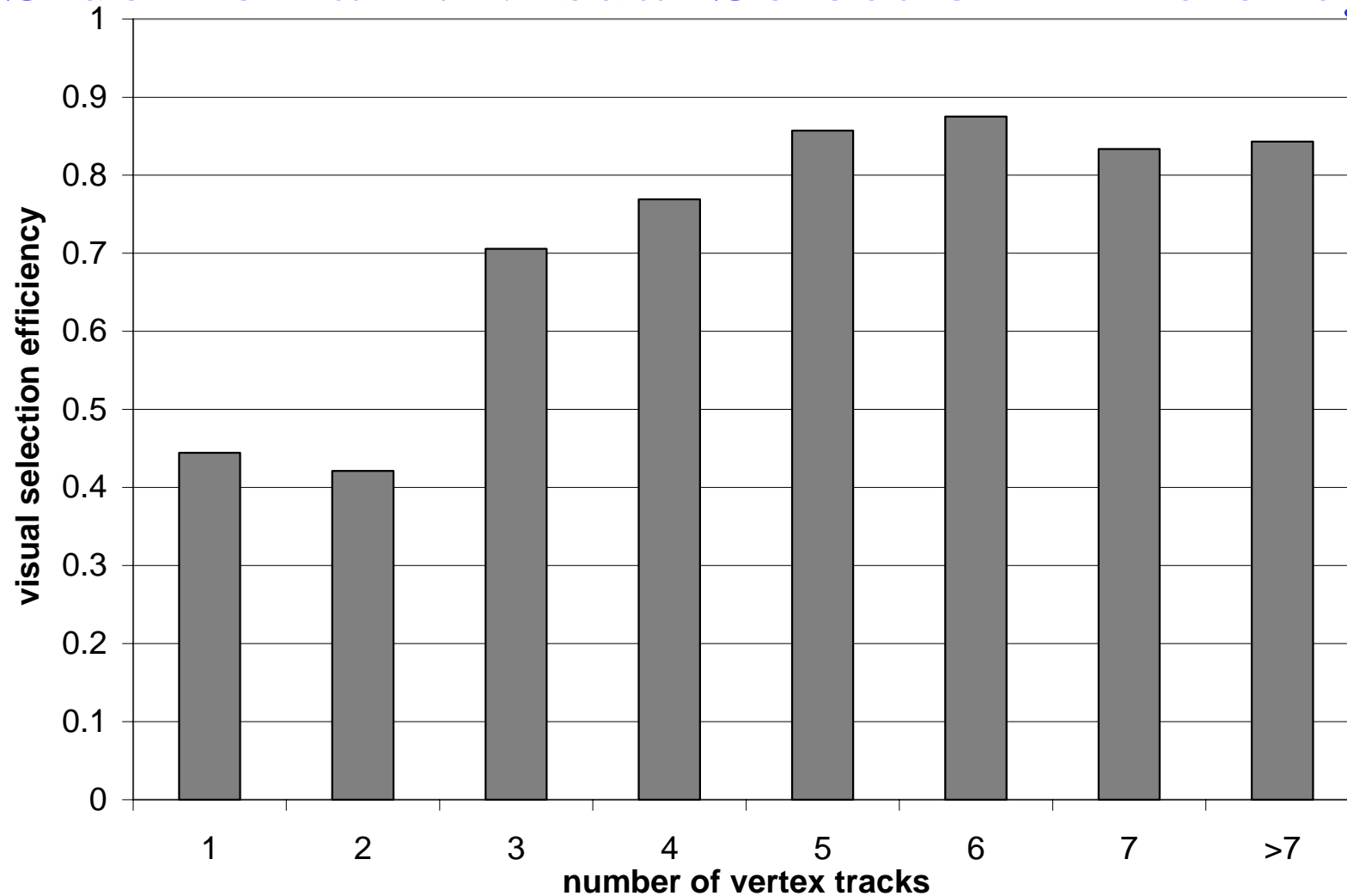
ν_τ CC interaction



NC interaction



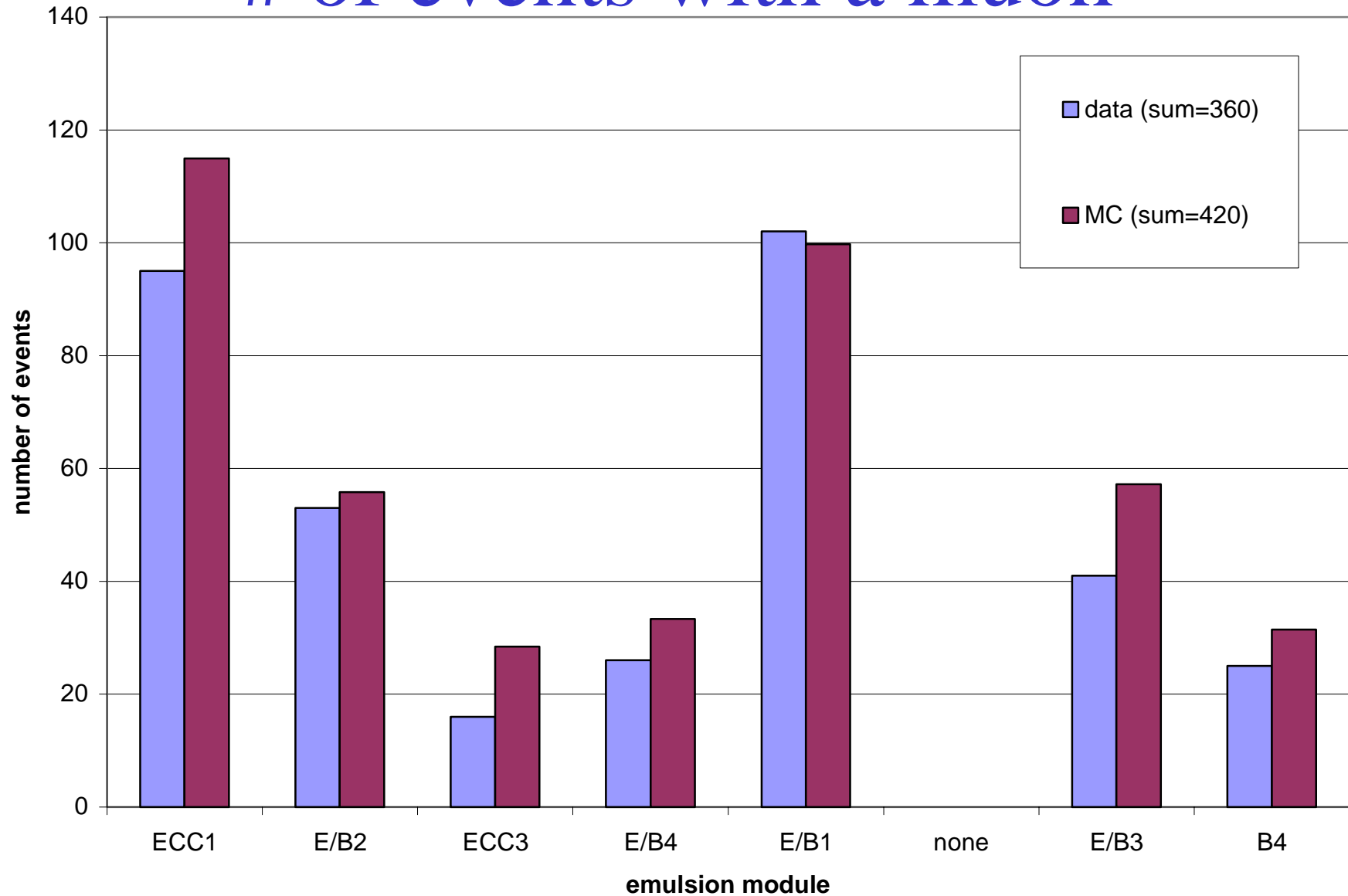
Side Remark: Visual Selection Efficiency



- From my nustrip muon analysis
- Only modules 2,3,4

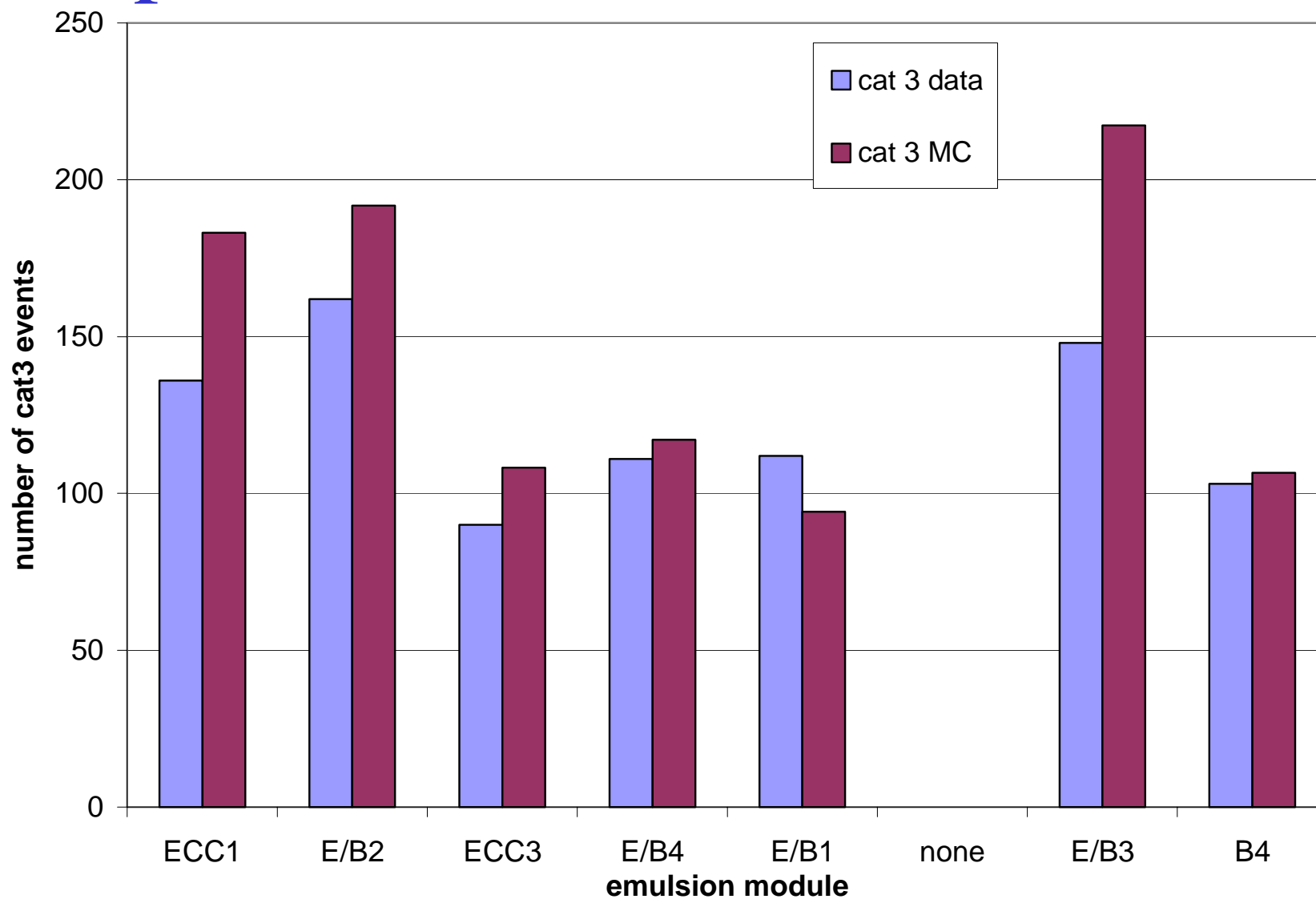


of events with a muon



(from nustrip files, my selection routines)

Expected number of cat 3 events



- sum=1000

- NC efficiency reduced by 0.6 (to 300 events)



Conclusions

- GEANT simulation results agree with data
 - software selected muons and cat3 events
 - including visual selection efficiency
 - if we reduce the number of NC events
- The efficiency to find cat 3 events is large
 - between 60% (mod 1) and 80% (mod 4)
- the fraction of self-vetoed events is unclear
 - should the veto have 20% (data from 1972) or 60% (GEANT simulation) neutron efficiency?
 - What did they measure in 1972?



Outlook

- What is the neutron detection efficiency in the upstream veto counters?
- We need to refine the MC-data comparisons
 - event type, event energy

